Amendments to the Drawings:

The attached sheet of drawings includes changes to Fig. 4. This sheet, which includes Figs. 3 and 4, replaces the original sheet including Figs. 3 and 4. Reference characters are changed in Fig. 4 as described in the remarks so that each reference character refers to only one element.

Attachment: Replacement Sheet

REMARKS/ARGUMENTS

The Office Action mailed June 15, 2005 has been reviewed and carefully considered. Claims 1-12 have been amended. Claims 17-19 are added. Claims 1-19 are pending in this application, with claims 1 and 7 being the only independent claims. Reconsideration of the above-identified application, as herein amended and in view of the following remarks, is respectfully requested.

Drawing Objections

The drawings are objected to because reference numbers 14 and 16 are each used to designate two different elements. Applicants note that a similar problem exists for reference characters 13 and 15. Fig. 4 has been amended so that some of the occurrences of references characters 13, 14, 15, and 16 are changed to 18, 19, 25, and 23, respectively, so that each reference character indicates only one element. The specification has been amended as required to the be consistent with the above drawing changes. In view of the amendments and remarks, the drawings objections should now be withdrawn.

Objections to the Specification

The specification is objected to because (1) the Examiner alleges that reference character 13 is not addressed in the specification and (2) reference character 16 is used to refer to two different elements on page 12 of the specification.

Regarding the first reason, reference character 13 is cited on page 10, line 18, and on page 12, line 16 of the specification.

Regarding the second reason, the specification has been amended so that reference character 23 refers to the "cladding layer" and reference character 16 refers to the "pump laser".

For all of the above reasons, the objections to the specification should now be withdrawn.

Listing of rejections in view of Prior Art

Claims 1, 3, 4, 15, and 16 stand rejected under 35 U.S.C. §102(b) as anticipated by U.S. Patent No. 5,684,817 (Houdre).

Claims 1 and 3-16 stand rejected under 35 U.S.C. §102(b) as anticipated by U.S. Patent No. 5,784,400 (Joannopoulos).

Claims 1-4, 15, and 16 stand rejected under 35 U.S.C. §102(a) as anticipated by U.S. Patent No. 6,416,575 (Yamada).

Claim 2 stands rejected under 35 U.S.C. §103 as unpatentable over Houdre in view of U.S. Patent No. 6,134,369 (Kirosawa) or U.S. Patent No. 6,898,362 (Forbes).

Claim 2 stands rejected under 35 U.S.C. §103 as unpatentable over Joannopoulos in view of Kirosawa or Forbes.

Brief Description of the Subject Matter of the Application

The following descriptive details are based on the specification. They are provided only for the convenience of the Examiner to facilitate the discussion of the rejections presented below, and are not intended to argue limitations which are unclaimed. The present application discloses a semiconductor laser having a semiconductor body 1 in which a plurality of cutouts 2 are formed (see Fig. 1, page 9, lines 8-9). The cutouts are arranged so that radiation

generated by the semiconductor laser is not capable of propagating within this arrangement (page 9, lines 9-11). A resonator 3 of the semiconductor laser is formed as a region of the semi-conductor body in which the arrangement of cutouts 2 is interrupted such that the radiation generated propagates in the region of the resonator (page 10, lines 1-4). The region of the resonator may be a strip as shown in Figs. 1 and 2 or may be angled as shown in Figs. 5 and 6. The semiconductor conductor laser may comprise a pump laser for pumping a quantum well structure 7 of a vertical emitter 13 arranged in the resonator 3 (page 10, lines 17-18).

Patentability of Claims over Prior Art

Independent Claim 1

Independent claim 1 is amended to recite "a plurality of discontinuities formed in a first region of said semiconductor body and arranged in an arrangement such that radiation generated by the semiconductor laser cannot propagate through said first region" and "a second region of said semiconductor body constituting the laser resonator, said second region being formed by an interruption of said arrangement and having none of said discontinuities formed therein, to enable propagation of radiation generated by the semiconductor laser through said second region".

Houdre fails to anticipate independent claim 1 because Houdre fails to disclose "a second region of said semiconductor body constituting the laser resonator, said second region being formed by an interruption of said arrangement" and because Houdre fails to disclose discontinuities arranged to prevent propagation through a first region.

Houdre discloses a semiconductor laser having a stack of layers including a substrate 5, a first confinement layer 2, a laser active layer 1, a second confinement layer 3, and a

contact layer 4 (see col. 2, lines 3-9; and Fig. 2a of Houdre). Holes are drilled from the upper face of the structure to make a photonic bandgap material on each side of the laser and at each of the ends of the laser, i.e., mirrors M1 and M2 (col. 2, lines 10-13). The reflection coefficients of the mirrors at the ends of the laser are adapted to the configuration requirements of the semiconductor laser (col. 2, lines 17-20). In the example of Fig. 2, the mirror M2 is less reflective than mirror M1 (col. 2, lines 22-26). Accordingly, Houdre discloses that various portions of the photonic bandgap material are made of different reflection coefficients such that each section of the drilled regions is made to its own requirements. That is, instead of having an arrangement which prevents propagation of radiation, the resonator of Houdre is surrounded by a plurality of areas having different reflection coefficients, and thus, radiation may pass through these regions. Accordingly, Houdre fails to disclose a first region through which radiation cannot pass and a second region through which radiation can pass, as expressly recited in independent claim 1.

Furthermore, since various portions of the photonic bandgap material are made of different reflection coefficients, the lasers can not be considered to be formed by an interruption of an arrangement, wherein the arrangement is such that "radiation generated by the semiconductor laser cannot propagate through said first region", as recited in independent claim 1. For all the above reasons, independent claim 1 is not anticipated by Houdre.

Regarding Joannopoulos, the Examiner states that Fig. 12 of Joannopoulos discloses the claimed subject matter. However, Fig. 12 of Joannopoulos discloses a semiconductor filter having a resonant cavity 1202 and input and output waveguides 1204, 1206 (see col. 6, lines 8-20). Joannopoulos nowhere discloses or suggests that the waveguides 1204, 1206 are resonators. These waveguides guide the radiation and do not amplify the radiation as

occurs in a resonator, as recited in amended independent claim 1. The only laser device disclosed by Joannopoulos includes a laser cavity 1102 arranged in close proximity to a waveguide 1104 (see Fig. 11; col. 5, line 63 to col. 6, line 3). Joannopoulos further states that the only exit port from cavity 1102 is into the waveguide (col. 6, lines 4-7). Since the laser resonator 1102 of Joannopoulos is completely surrounded by an array of columns, the region surrounding the laser generator must allow some of the radiation to exit through the columns. Accordingly, Joannopoulos does not disclose "a plurality of discontinuities formed in a first region of said semiconductor body and arranged in an arrangement such that radiation generated by the semiconductor laser cannot propagate through the first region", as expressly recited in independent claim 1. Since Joannopoulos fails to disclose the first region, Joannopoulos also fails to disclose "a second region of said semiconductor body constituting the laser resonator, said second region being formed by an interruption of said arrangement and having none of said discontinuities formed therein, to enable propagation of radiation generated by the semiconductor laser through said second region", as expressly recited in independent claim 1. Accordingly, independent claim 1 is not anticipated by Joannopoulos.

Yamada fails to disclose or suggest "a second region of said semiconductor body constituting the laser resonator, said second region being formed by an interruption of said arrangement". Yamada discloses a photonic crystal multilayer substrate. The Examiner refers to Fig. 4 of Yamada and alleges that element 18 discloses the claimed laser resonator. However, element 18 in Yamada is a waveguide (see col. 7, lines 16-24). The only laser devices disclosed by Yamada are used for coupling radiation into waveguides (see VCSEL 20 in Fig. 5 and edge emitting laser 25 in Fig. 6). These laser devices do not have a laser resonator. Accordingly, Yamada fails to disclose "a second region of said semiconductor body constituting the laser

resonator, said second region being formed by an interruption in said first region", as expressly recited in independent claim 1.

Independent Claim 7

Independent claim 7 recites "a vertical emitter comprising a quantum well structure in a semiconductor body, and with a pump radiation source, which generates pump radiation for optically pumping said quantum well structure" and "a waveguide for coupling said pump radiation into said quantum well structure, wherein said waveguide is laterally delimited at least partly by an arrangement of a plurality of discontinuities arranged in said semiconductor body in such a way that said pump radiation is not capable of propagating within said arrangement".

The Examiner's rejection of claim 7 refers to col. 6, lines 8-28, of Joannopoulos, which describes a filter shown in Fig. 12 of Joannopoulos. The filter includes an input waveguide 1204, a resonant cavity 1202, and an output waveguide 1206 (see col. 6, lines 8-20 of Joannopoulos). As described at col. 6, lines 17-20, the principle exit port of the resonant cavity is into the output waveguide 1206, i.e. laterally. Joannopoulos fails to disclose, teach or suggest a vertical emitter with "a quantum well structure", and "a pump radiation source, which generates pump radiation for optically pumping said quantum well structure", as expressly recited in independent claim 7. The resonant cavity 1202 of Joannopoulos is not a vertical emitter but is described as being merely a cavity which passes specified portions of electromagnetic energy to an output waveguide (see col. 6, lines 20-24 of Joannopoulos). Accordingly, independent claim 7 is not anticipated by Joannopoulos under 35 U.S.C. §102.

Dependent Claims

Dependent claims 2-6 and 8-19, each being dependent on one of independent claims 1 and 7, are allowable for at least the same reasons as are independent claims 1 and 7, as well as for the additional recitations contained therein.

New dependent claim 17 is added to recite that the semiconductor body comprises outer side areas forming resonator mirrors of the laser resonator. Support is on page 10, lines 2-4, of the specification. Neither Joannopoulos nor Yamada disclose mirrors. Houdre discloses mirrors made from the drilled material. Accordingly, new dependent claim 17 is allowable for at least these additional reasons.

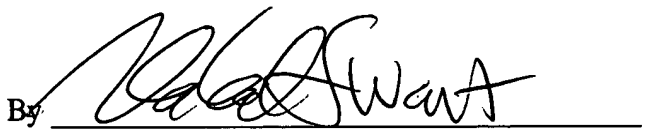
New dependent claim 18 is added to recite that the waveguide and quantum well are monolithically integrated. Support for this limitation is found on page 7, lines 19-21. This is not disclosed in either Joannopoulos, Yamada, or Houdre. Accordingly, new dependent claim 18 is allowable for these additional reasons.

New dependent claim 19 is added as dependent on claim 10 and recites that the discontinuities are arranged in an arrangement and that the second region is formed by an interruption in the arrangement. This is similar to the recitation in independent claim 1 and is allowable for the same reasons.

It is believed that no fees or charges are required at this time in connection with the present application. However, if any fees or charges are required at this time, they may be charged to our Patent and Trademark Office Deposit Account No. 03-2412.

Respectfully submitted,

COHEN, PONTANI, LIEBERMAN & PAVANE

By 

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